



Over 30 Years of Conservation Innovation



2024 Replicated Farmer Phosphorus Plot – Sandusky County

Objective

To evaluate the agronomic and economic impacts of phosphorus fertilizer applications.

Background

Crop Year: 2024 corn

Location: Gibsonburg

County: Sandusky

Soil Type: Hoytville Clay Loam

Drainage: Pattern

Tillage: Strip-till

Previous crop: Soybean

Soil test preplant: pH 6.1 , P 35 ppm M3, K 200 ppm, CEC 18.0 , O.M. 3.0 %

Herbicides: Lexar EZ, Roundup,

Planting Date: 5-31-24

Variety: Axis 54T64

Seeding Rate: 33,880

Fertilizers: see below

Harvest Date: October 21, 2024

Methods

The addition of Phosphorus (P) to a cropping system has been a longstanding practice within the industry. P is often the nutrient of concern in regard to water quality and the formation of toxic algal blooms. This study was conducted in the Western Lake Erie Basin, an area where producers are actively exploring strategies that are agronomically, economically, and environmentally sound when contemplating P amendments. (K. Lovejoy)

Phosphorus (P) starter fertilizer was compared to no phosphorus applied. Treatments were replicated three times in a randomized complete block design. The two treatments were 1) No P added and 2) MAP fertilizer added in the fall strip till. In 2024, corn was planted in the same treatments and data collected according to the location of 2023 fall strip-till treatments. Treatments are 60 feet wide by 1500 feet long. All treatments received the same inputs except for phosphorus fertilizer. Yields and moistures were obtained by using a calibrated yield monitor. Yields were adjusted to 15.5% moisture.

Treatments:

1. No Phosphorus fertilizer
2. Phosphorus fertilizer (MAP 11-52-0) applied 10-10-2023 strip till

Results

Table 1. Impact of Phosphorus (P) Fertilizer

Starter P Rate (lb/ac of MAP)	Corn Yield (bu/ac)	Value of Grain (\$/ac)	Cost of P (\$/ac)	Return Minus P Cost (\$/ac)
0	208.1	\$780.37	0	\$780.37
115	209.4	\$785.25	\$46.00	\$739.25

CV 2.37; P<.10, No Significant Difference in yield. Based on \$3.75/bu corn 2024 price and \$800/ton MAP (\$0.40/lb.) at 2023 price

Table 2 Weather Data

	2024 Local Rainfall WeatherLink (Rollersville)	Gibsonburg Historic Rainfall www.weather-us.com
May	2.96 in.	3.5 in.
June	3.00 in.	3.5 in.
July	1.47 in.	3.11 in.
August	2.63 in.	2.91 in.
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Total	10.06 in.	13.02 in.

Table 3 Standard Soil Test (A & L lab) V5 growth stage

	No P Fertilizer	Phosphorus Applied	CV	LSD P<.10)
OM %	3.3	3.4	6.3	NS
Phosphorus P-M3 (ppm)	65.7	52.3	24.01	NS
Potassium (ppm)	257	220	11.44	NS
pH	6.2	6.3	3.4	NS
CEC	17.7	18.4	4.81	NS
Ca %	67.2	68.6	5.21	NS
Mg %	13.1	15.0	7.15	NS

Table 4 Haney Soil Health Test (Regen lab) V5

	No P Fertilizer	Phosphorus Applied	CV	LSD P<.10)
CO2 (ppm) Respiration	62.6	64.2	30.1	NS
Org.C (ppm) C (organic C)	262.7	257.7	4.25	NS
MAC % (microbially active C)	24.3	25.3	33.7	NS
C:N (carbon:nitrogen ratio)	11.6	11.5	6.1	NS
SHC (soil health score)	13.8	13.8	13.8	NS
Available N (lbs/ac)	66.8	61.3	10.0	NS
Available P (lbs/ac)	90.5	71.0	40.2	NS
POxC(ppm) (active carbon)	481.8	499.8	12.71	NS

Table 5 PLFA Test Phospholipid Fatty Acids (Regen lab) V5

	No P Fertilizer	Phosphorus Applied	CV	LSD P<.10)
Total Biomass(ng/g soil)	2109	6319	14.98	1505 signif.
Functional Group Diversity	1.2	1.5	14.94	NS
Total Bacteria (% of Biomass)	35.8	40.4	6.67	NS
Total Fungi (% of Biomass)	4.2	8.3	28.47	NS
Protozoa (% of Biomass)	.2	.3	122	NS
Undifferentiated (% of Biomass)	59.9	51.0	7.87	NS

Table 6 Plant Tissue Analysis (A & L lab) R1 initial silk

	Normal Range	No Phosphorus Fertilizer	Phosphorus Applied	CV	LSD P<.10)
Nitrogen %	3.0-4.0	2.2	2.0	17.22	NS
Phosphorus %	0.25-0.45	0.3	0.3	19.16	NS
Potassium %	2.0-2.5	2.6	2.1	4.01	0.23 signif
Magnesium %	0.13-0.30	0.2	0.3	16.98	NS
Calcium %	0.25-0.50	0.3	0.3	14.03	NS
Sulfur %	0.15-0.50	0.2	0.1	22.03	NS

Summary

Corn yield was not significantly different with the addition of fertilizer phosphorus in 2023. However, a loss of \$41.12 per acre was incurred when phosphorus fertilizer was applied (table 1). Soil and plant testing showed no significant difference with phosphorus fertilization (table 2-6) except PLFA biomass and tissue potassium.

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